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MEDICAL APPLICATIONS OF ULTRASOUND IN USSR

Meditsinsky Rabotnik
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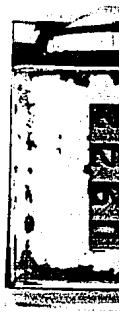
Docent N. Krylov,
Head, Physical Therapy, Moscow Oblast
Sci Res Clin Inst im. M. F. Vladimirskiy



If ultrasound is passed through the human body, it advances with different velocities in different tissues. It will be of great interest to investigate the possibilities of utilizing ultrasound for determining the location of foreign objects which cannot be seen in the body, and also of tumors, abscesses, and other pathologically changed tissues and formations.

Ultrasound is also useful for the preparation of stable emulsions of drugs.

When ultrasonic waves spread through the air, they may effectively precipitate dust and smoke particles suspended in the air through which they pass. Thus, ultrasound can be used for air purification.

Ultrasound exerts a strong effect on large cells, e.g., protozoa and erythrocytes. It is capable of destroying living cells, including those of bacteria. The destruction of these cells by ultrasound is accompanied by the liberation of enzymes, antibodies, and other substances.

Data accumulated at present indicate that ultrasound can be used for therapeutic purposes. The most characteristic therapeutic property of ultrasonic waves is that of alleviating pain. Also, they have the effect of defibrating (softening) hardened connective tissue. Beneficial results have been obtained in the treatment with ultrasound of neuralgias, myosites, lumboischialgias, cutaneous and other scars, polyarthrites, spondylarthrites, spondylarthroses, sclerodermias, and other abnormal conditions. Apparently, ultrasound improves the trophic state of tissues by influencing their metabolism. This is indicated by the initial results obtained in successful ultrasonic treatment of trophic ulcers of the legs, the stomach, and other organs.

The data on the therapy of malignant tumors with ultrasound are not quite adequate as yet to permit definite conclusions in regard to the application of this method in human medicine. However, experiments on animals have established that irradiation with large doses of ultrasound suppresses the growth of cancer cells. Conclusions on the therapeutic value of ultrasound in other diseases besides cancer will be possible in the near future.

Of particular importance for surgery is application of the so-called piezoelectric or ultrasonic probes. Instruments of this type were created during World War II by workers at the Chair of Physics, Leningrad Pediatric Institute. The ultrasonic probe consists of a metal feeler and a piezoelectric telephone. The piezoelectric probe cannot only detect a metal or bone splinter located deep in the tissues of the body, but can also determine the nature of this splinter. If the splinter has jagged edges, the noise in the earphones is intermittent and resembles scratching, while a smooth splinter gives rise to a rustling sound.

A surgeon's scalpel may be used simultaneously as an ultrasonic feeler. When the surgeon cuts tissues of different degrees of resiliency, the scalpel will vibrate differently depending on the tissue, so that the surgeon can determine from the sound which tissue he is cutting. Probes and scalpels equipped with sound are not yet being used extensively, but the prospects of their use in the future are bright.

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The use of ultrasound in medicine is far behind industrial and other applications (testing of metals, signaling devices, recording of sound, determination of the depth of the sea, detection of submarines and subsurface rocks, etc.). The USSR medical industry must expedite the development and release of medical ultrasound appliances, while the scientific research institutes, particularly the State Institute of Physical Therapy, must participate more actively in research on ultrasound.

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